Omni-polar, Low Power, MR Switch Sensor

Feature

- AMR+CMOS monolithic structure
- High sensitivity
  B_{OP}=± 18Gauss, B_{RP}=± 15Gauss
- Low power consumption
  Average supply current <1.3uA (Typical)
- Wide operating temperature range
  -40~125°C
- Push-pull Output Mode
- RoHs compliant 2011/65/EU

Application:

- Position Detection
- Proximity Detection
- Speed Detection
- Flow meters including water meter, gas meter and heat meter

Product Description

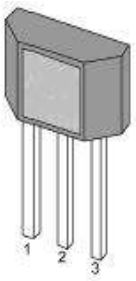
The MR643X is a monolithic IC with built-in MR magneto-resistive element and CMOS switch. The IC internally includes a MR bridge, a voltage regulator for operation with supply voltage from 1.8V to 5.5V, a sleep/awake logic for low power consumption, small signal amplifier and Schmitt trigger comparator with dynamic offset cancellation, and a push-pull output.

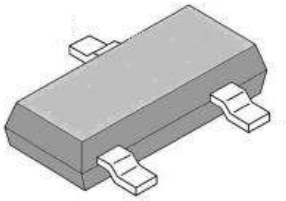
When combined with a magnet, it becomes a non-contact switch with low current consumption, high sensitivity and reliability. A horizontal magnetic field parallel to the electrode of the package can be detected by an arbitrary polarity.

The MR643X is ideal for use to gather speed and detect position, particularly suited for applications that require accurate duty cycle or accurate edge detection and low power consumption such as speed detection in smart meters.

Pin definition

Name	Number	Description
VDD	1	Power Supply
GND	2	Ground
OUT	3	Output Signal

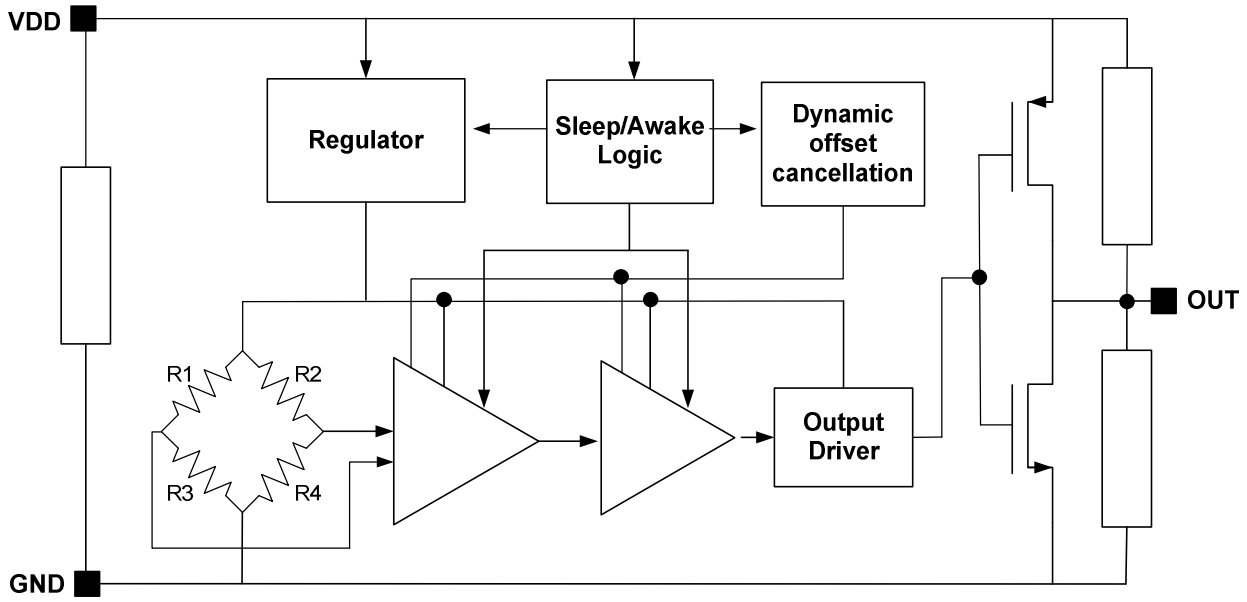




Family members

Part Number	Description
MR6431A	Flat TO-92 package, bulking packaging(1000pcs/bag)
MR6432A	Flat TO-92 package, bulking packaging(1000pcs/bag)
MR6431AT	SOT-23 package ,tape and reel packaging(3000pcs/bag)
MR6432AT	SOT-23 package ,tape and reel packaging(3000pcs/bag)

Block Diagram



Function Description

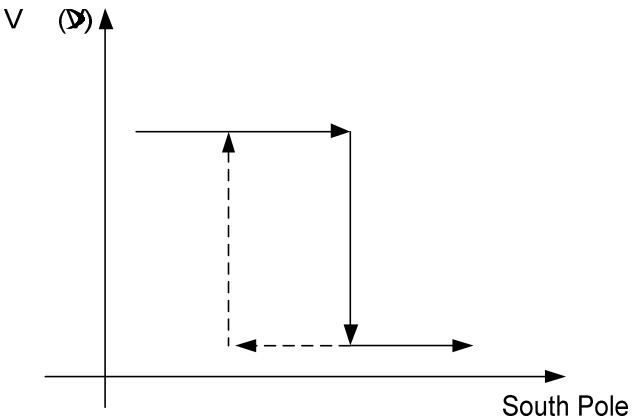
Definition of magnetic parameters

B_{OP}: Operating point, magnetic flux density that turns the output driver ON (V_{OUT}=Low)

B_{RP}: Release point, magnetic flux density that turns the output driver OFF (V_{OUT}=High)

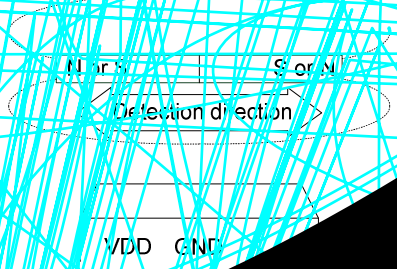
B_{HYST}: Hysteresis window, $|B_{OP}-B_{RP}|$

Definition of Switching Function



Drawing Illustrating Detectable Magnetic Field

Flat TO-92 package



Electrical Characteristics

At T_A=-40°C to 125°C , V_{DD}=1.8V to 5.5V (Unless other specified)

Symbol	Parameters	Test Conditions		Min	Typ	Max	Units
V_{DD}	Supply voltage	Operating		1.8	-	5.5	V
I_{DD}	Supply current	MR6431	V_{DD}=3.6V	-	1.3	2.0	uA
		MR6432	V_{DD}=3.6V	-	4.1	7.0	uA
V_{OL}	Output low voltage	I_{OUT}=5mA, $\|B\|>\|B_{OP}\|$		-	-	0.2	V
V_{OH}	Output high voltage	I_{OUT}=5mA, $\|B\|<\|B_{RP}\|$		V_{DD} -0.3	-	-	V
I_{OFF}	Output leakage current	V_{OUT}=5.5V, $\|B\|<\|B_{RP}\|$		-	-	1.0	uA
T_{PO}	Power on time			-	-	100	us
R_{TH}	SOT-23package thermal resistance			-	301	-	°C/W
ESD	Electro-Static Discharge	AEC-Q100		Class 3			
Fsw	Switching frequency	MR6431	V_{DD}=3.6V	-	20	-	Hz
		MR6432	V_{DD}=3.6V	-	900	-	Hz
T_{AW}	Awake Time	MR6431	V_{DD}=3.6V	-	12	-	us
		MR6432	V_{DD}=3.6V	-	12	-	us
T_{SL}	Sleep Time	MR6431	V_{DD}=3.6V	-	50	-	ms
		MR6432	V_{DD}=3.6V	-	1.11	-	ms
D.C.	Duty Cycle	MR6431	V_{DD}=3.6V	-	0.02	-	%
		MR6432	V_{DD}=3.6V	-	1.1	-	%

Magnetic Characteristics

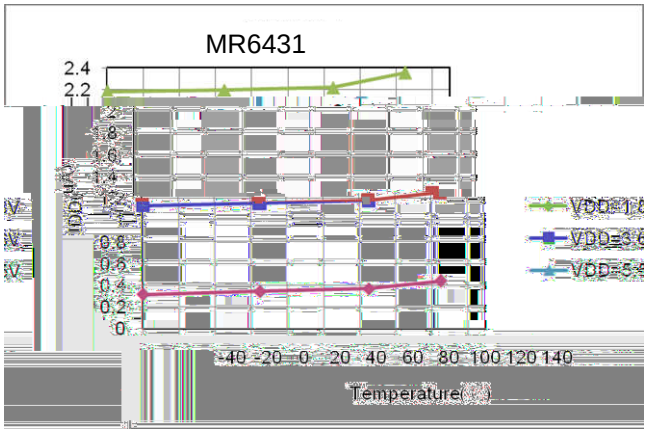
At V_{DD}=1.8V to 5.5V

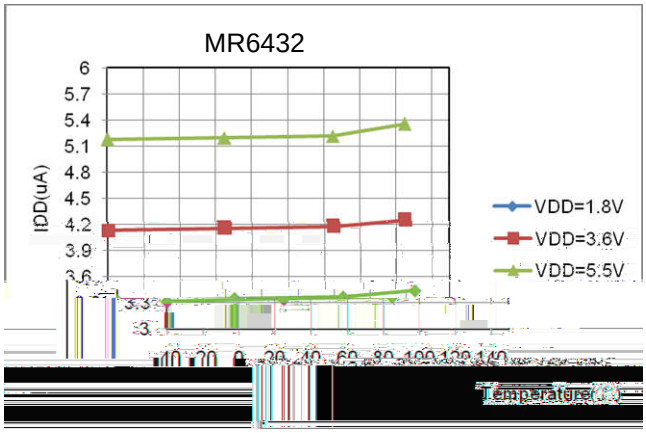
Symbol	Parameters	Test Conditions	Min	Typ	Max	Units
B_{OP}	Magnetic operating point	At T_A=25°C	-	±18	-	Gauss
B_{RP}	Magnetic release point	At T_A=25°C	-	±15	-	Gauss
B_{HYST}	Hysteresis window	At T_A=25°C , $\|B_{OP}-B_{RP}\|$	-	3	-	Gauss

Characteristic Performance

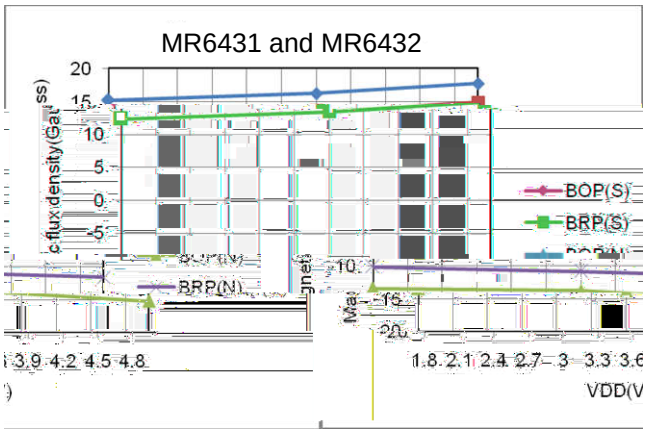
Electrical Characteristics

Average Supply Current versus Temperature

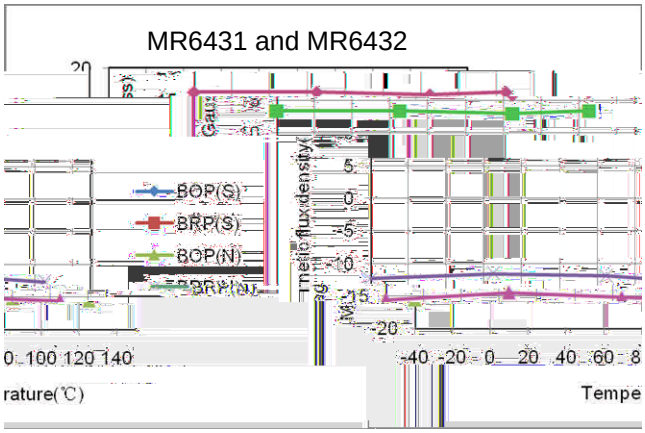




Magnetic Characteristics versus Supply Voltage (T_A=25℃)

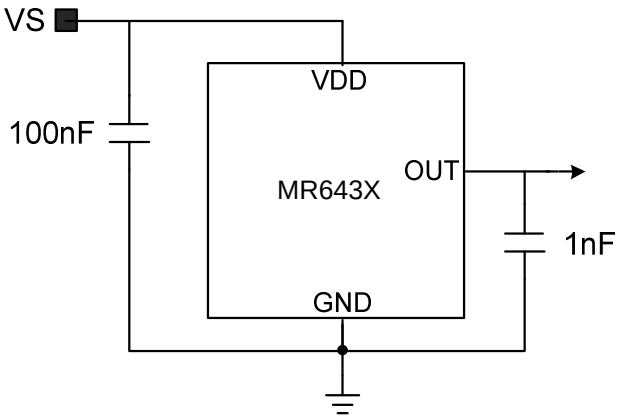


Magnetic Characteristics versus Temperature (V_{DD}=3.6V)

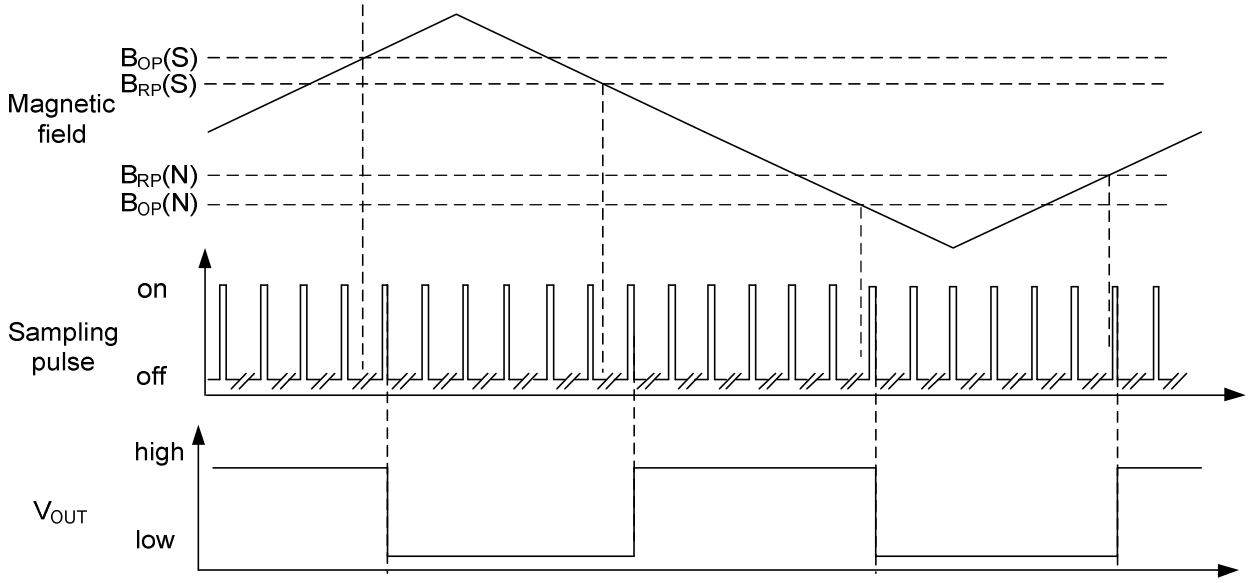


Application Information

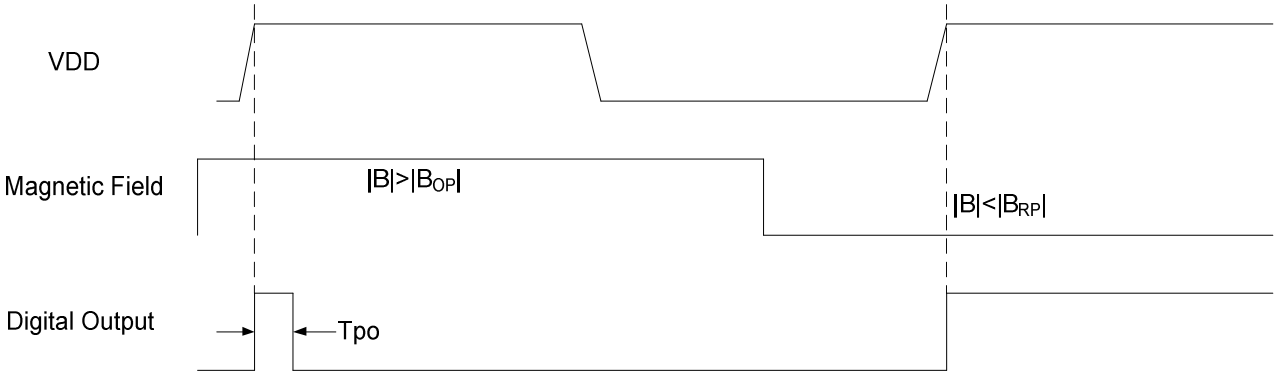
Typical Application Circuit



Operating Waveform



Power On Output Waveform

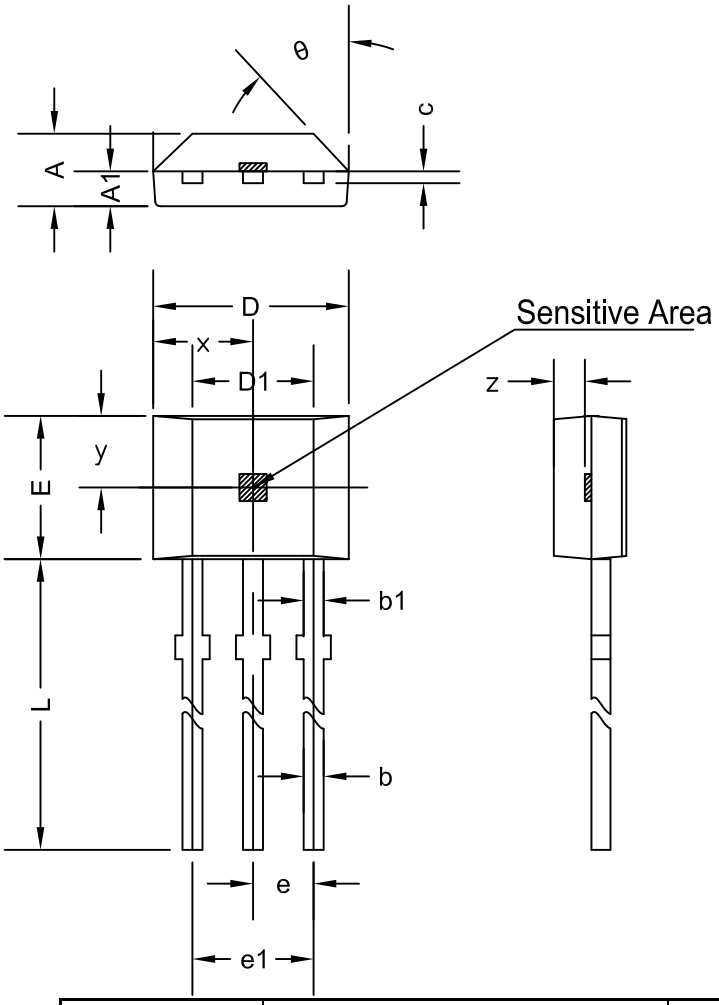


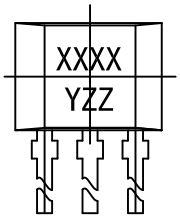
Note: V_{DD} rise time <1us, Tpo is the time from V_{DD} becoming stable to output becoming valid.

Omni-polar, Low Power, MR Switch Sensor

PACKAGE DESIGNATOR

MR6431A MR6432A TO-92UA





XXXX — Product ID

YZZ — DateCode: Y (year, 0~9) ZZ (week, 01~55)

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.670	0.056	0.066
A1	0.660	0.860	0.026	0.034
b	0.350	0.560	0.014	0.022
b1	0.400	0.550	0.016	0.022
C	0.360	0.510	0.014	0.020
D	3.900	4.200	0.154	0.165
D1	2.970	3.270	0.117	0.129
E	2.900	3.280	0.114	0.129
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	13.500	15.500	0.531	0.610
x	2.025TYP		0.080TYP	
y	1.545TYP		0.061TYP	
z	0.500TYP		0.020TYP	
θ	45°TYP		45°TYP	

PACKAGE DESIGNATOR